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ABSTRACT

How teachers create and foster a learning environment that promotes creative thinking and problem solving skills in students was investigated in a 1-year study in a community college in Texas. The study explored the teaching methods and classroom climates created by eight exemplary teachers who demonstrated exceptional approaches to promote creative thinking and problem-solving skills. These teachers were selected by a process that began with 113 semistructured and many informal interviews with students. Factors frequently identified in student interviews were climate, teacher personality, teacher attitude, classroom management, teacher knowledge, teacher-student interactions, and student attitudes. Results did not indicate any ultimate method to use in teaching nor any ultimate process that fosters classroom learning climate toward the promotion of creative thinking. Observation of these teachers leads to the conclusion that teachers should construct teaching methods with the following elements: (1) classroom climate; (2) teacher character traits; (3) classroom management; (4) teacher's passion and attitude toward students, subject, and teaching; (5) teaching style; (6) teacher's knowledge; (7) teacher-student interaction; and (8) students' attitudes. Two appendixes illustrate interaction and a teaching model. (Contains 2 appendix figures and 23 references.) (SLD)

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Creating and fostering a learning environment that promotes creative thinking and problem solving skills

By: Khalid Hamza, Ph.D. & William R. Nash, Ed.D.

December 1996

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ABSTRACT

How can teachers create and foster a learning environment that promotes creative thinking and problem solving skills in students? What types of methods and classroom climates do teachers need to promote creative thinking? How might students react to such classroom environments? This article shares the results of a one year study conducted at a community college in Texas. In this study, the researcher explored teaching methods and classroom climates created by exemplary teachers who demonstrated exceptional instructional approaches that promoted creative thinking and problem solving skills in students.

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Several studies of educational and business literature (Alexander, Murphy, & Woods, 1994; Campbell, 1995; Carr, 1994; Covey, 1989; Dacey, 1989; de Bono, 1992; Dent, 1995; di Sessa, 1988; Drucker, 1986; Gates, 1995; Hakim, 1994; Parker & Case, 1993; Postman, 1993) indicated that numerous educational, teaching, and academic factors greatly influence a student's future learning and future productivity in the career workplace.

Available research in educational psychology (Alexander, Murphy, & Woods, 1994; di Sessa, 1988; Pintrich, Marx, & Boyle, 1993; Postman, 1993), in supplementation to life experiences, workplace experiences, and individual insights, uncovered deficiencies in educational teaching methods and strategies in which creative thinking and problem solving are taught. Observations of numerous academic experiences that students meet during their college years suggest that these deficiencies in teaching methods and strategies significantly impede students' abilities to become productive workers. At Lone Star Community College ("LSC"), located in the Central Texas Community College District ("CTCCD"), Administr tion sensed that such an obligation was unfulfilled. Recently, CTCCD asked students: "Given that a student who leaves Lone Star College should be a contributing member of society, what do you think are the important skills, abilities and awareness critical to your community college education?" Responses to this question did not include suggestions that students should possess creative thinking

and problem solving skills. Only a few responses indirectly mentioned the need for thinking skills.

PURPOSE OF THE STUDY

The researcher conducted the study to identify, investigate, and explore exemplary instructional approaches of eight selected community college professors who fostered learning environments that nurtured creative thinking and problem solving.

RESEARCH QUESTIONS

1. What types of methods, strategies, interactions and communications did the teacher practice to develop creative thinking and problem solving skills in students?
2. In what ways did individual characteristics of the teacher promote creativity in the classroom?
3. What were students' attitudes toward a classroom environment that promoted creative thinking and problem solving?

METHODOLOGY

The respondent pool selected was a number of professors who demonstrated exceptional methods and strategies in promoting creative thinking and problem solving in the classroom.

Students were the primary source in identifying the purposive sample of teachers. The researcher conducted continuous, semi-structured and informal

interviews with selected students and respondents. The researcher developed interviews using the ethnographic process recommended by Spradley (1979). A purposive sample of teachers emerged in which the researcher observed, collected, and analyzed perceptions, attitudes, styles, interactions, and strategies in classroom instruction that foster creative thinking and problem solving in learning environments.

In addition, the researcher conducted interviews to survey student attitudes toward these methods of instruction. Data collection and analysis conducted throughout this study contributed to the overall investigation. In conducting this study the researcher synthesized data through inductive processes that led to the findings . As a result, these findings might be helpful to other institutions of higher education to promote creative thinking and problem solving in students.

PROCEDURES

The study progressed in three phases. In Phase I, the researcher conducted semi-structured and informal interviews with students and teachers from LSC. A total of 113 semi-structured interviews and numerous informal interviews were conducted to assist in the selection of the exemplary teacher pool. In addition, the researcher selected and interviewed teachers mentioned most frequently by students from the data collection and data analysis who demonstrated strong indications of fostering a learning environment that promotes creative thinking.

Data collection, data analysis, member checking processes, and emerged constructions were continuous throughout the research study. Data collected and analyzed from all Phase I student and teacher interviews were primary instruments in identifying the teacher purposive sample. Grounded theory emerging from data analysis, findings, and synthesis of extensive literature review assisted in the development of a checklist supporting the exemplary teacher selection process.

In Phase II, the researcher continued to add data to the reflexive journal, research literature, documents examinations, peer debriefing, data collection, data analysis, and member-checking processes. The researcher attempted to form connections among shared constructions by introducing them to the hermeneutic-dialectic circle. The hermeneutic-dialectic process is a method used in naturalistic observation research to establish authenticity in which emerging constructions of all stakeholders have equal entry to the process to share conclusions, recommendations, and courses of action. Simultaneously, the process educates and empowers all involved parties. In addition, the researcher conducted classroom observations and explorations of eight teachers' classrooms. Phase III, a continuum of Phases I and II, included the survey of student attitudes in observed classroom settings and the report summary. Data collection and data analysis continued in preparing the final report.

ANALYSIS OF DATA

The researcher gathered data and analyzed it according to naturalistic inquiry and ethnographic guidelines. Data analysis followed each interview, each observation period, and at the conclusion of each field setting exploration. The analysis of this research data is best described as a progression, not a stage. It is an ongoing process, not a one-time event in which systematic steps in analyzing data collected from this study involved constructions from context and revision of these constructions into meaningful, whole relationships (Erlandson, 1993). Case study writing, the vehicle of choice for reporting results of this naturalistic study, was descriptive and factual more than it was interpretive and evaluative.

ANALYSIS OF FINDINGS, SUMMARY OF OBSERVATIONS, AND CONCLUSION

For decades, education in the US endured a silent and gradual revolution in goals and methods used to increase the awareness toward creative problem solving and creative experiences. However, many educators have not yet realized that such changes occurred toward more creative education. Similarly, little significant change occurred in teaching methods and teacher-student relationships (Torrance, 1977).

Many significant factors emerged from this study's interviews and classroom observations of students and teachers at LSC that contributed to a greater understanding of learner and teacher. Although these factors differ in nature of

creation and intensity among teachers and observed classrooms, such factors become pillars in building classroom climate that fosters creative thinking and problem solving. Watchful analysis of the data indicated that these factors recur in interview responses. These factors include: climate, teacher personality (character traits), teacher attitude (toward subject and teaching), classroom management, teacher knowledge, teacher-student interactions, and student attitudes.

Emerging constructions from this study indicate that there is no ultimate method to use in teaching, nor is there an ultimate process that fosters classroom learning climate toward the promotion of creative thinking. Although the teachers in this study differed from each other in personality, in style of teaching, and in the climate they created they, nevertheless, shared common, valuable qualities. They: 1) learned from failure and success; 2) possessed a strong passion for what they do; 3) drew from massive experiences, exercising positive influence in teaching and learning; 4) cared about student success and failure; 5) experienced life from unique perspectives; 6) were very interested in the subject taught; 7) possessed general knowledge of other fields and areas of study; 8) used analysis and synthesis processes in decision making; 9) developed a rich body of knowledge in the subject taught; and 10) created unique, original styles and methods of teaching.

Such characteristics enabled these educators to manifest miraculous results in the learning process that reflected in student responses and survey of attitudes. Some teachers appeared to be more analytical, logical, and systematic; some

appeared to show greater encouragement for exploration and discovery. Despite their individual styles and approaches to classroom instruction, all of their expressed teaching behaviors were spontaneous, intuitive, unique, and original. In contrast, however, this nation's educational system tends to emphasize more sequential, linear, logical, analytical, individualistic, and field-independent cognitive styles (Hilliard, 1989; Kuykendall, 1992).

According to Torrance and Safter (1990), students prefer to learn creatively by exploring, questioning, experimenting, manipulating, listening, and testing. Reacting to powerful cultural forces, however, educational institutions encourage intelligence and logic, insisting that students learn by authority.

Notably, students do not learn exclusively through authoritarian command. Authoritarian systems of learning lack flexibility, originality, elaboration, uniqueness, novelty, fluency, and purposiveness of creative thinking. "The preservation of this nation's way of life and future security depends upon its most important national resources; intellectual abilities and, more important, creative abilities. It is time, then, that we learn all we can about those resources" (Guilford, 1959, p. 2).

In *A Climate for Inventing*, Paul Torrance wrote: "When men or nations invent they live and grow. When they cease to do that they decay and die. This has been true from the beginning" (Torrance, 1987, p. 235). Teachers and students at LSC came from diverse backgrounds; however, both strived to create a unique

experience that promoted creative thinking and problem solving in students and teachers.

Many of these students seemed to learn better and think more critically and more creatively in a "safe environment," a term which students and teachers used frequently during their interviews. To their way of thinking, safe environments are settings in which they do not feel threatened, but feel comfortable to express opinions and ideas. Many of these students are intuitive, courageous risk takers; they are brilliant, open to change, creative, emotional, dedicated, and care much about their learning experience. In return, they also hold the same expectations of their teachers.

When they visited with the researcher about what constitutes a creative environment, students used the following key words most frequently to express their opinions:

> Learning; fun; interest; freedom to voice opinions; enthusiasm; comfortable and safe environment; humor; challenge; openness; love of the teacher for teaching and for the subject taught; encouragement to think; student-teacher interaction; student-student interaction, respect, and challenge of one's own thinking.

They also expressed opinions about experiences that they usually had as students. Those experiences sharply contrasted with experiences they had with favorite and exemplary teachers. In those classrooms students frequently commented that,

unlike the creative environments mentioned above, they felt stifled in expressing creative ideas. In addition, they felt an overwhelming pressure to conform and obey to rigid classroom structural guidelines.

The respondent pool of teachers selected for this study were open to new possibilities. They responded favorably to student concerns, ideas, and questions; they verified the importance and value of student ideas; and they were skillful in capturing students' attention. In addition, they understood the significance of basic skills to creativity and emphasized these skills in their classrooms. They guided students through the learning process with care, wisdom, and knowledge. Some teachers used many approaches not only to motivate students in their thinking, but also to produce interest and excitement. Frequently they constructed debate, discussions, and role playing scenarios to accomplish such goals.

Without exception, all of these teachers connected prior information and prior required entry skills to new information and new knowledge. They used brainstorming activities and synectics exercises to relate problems and ideas that seemed difficult, if not impossible, to otherwise describe. Throughout the learning process, these teachers used critical monitoring and continuous evaluation methods (by way of discussions, group projects, or teacher-student interaction) to assist in diagnosing the prerequisite skills that the students already possessed. Making these evaluations by the teacher were essential in planning instructional focus and individually guiding students' needs in learning new materials and new skills.

Intrinsically, the teacher was able to minimize confusion and avoid unnecessary instructions; this permitted extra time for the teacher to focus on problems such as skills deficiencies and content misinterpretations (Gagnè, et al., 1992). Some of the teachers encouraged students to create the connections on their own; others created the connections for them. All of these teachers showed respect toward the students and treated them as adults, younger colleagues, and future professionals.

Controversial debate emerged from opposing student views; the teachers in this study showed respect toward the students for each differing opinion. These teachers also provided guidance and direction to students; they critically, constructively, and creatively monitored and coached questions, activities, and exercises. Without exception, all of these teachers dedicated much time and effort beyond the physical time limitations of the classroom.

Before, during, or after the lectures, some of the teachers engaged students in activities, exercises, and games. These teachers informed students of the purpose of such activities. Other teachers lectured and engaged students in learning by arousing their attention and interest for the subject matter. Despite the nature of the subject, all teachers stirred student interest by comparing important, related issues with unrelated issues. Through their unique style of teaching, these teachers possessed a rich body of knowledge domain specificity and expertise. They also possessed nonspecific global knowledge in other unrelated areas. None of them followed a script, rigid or otherwise; however, all of them knew where they were,

where to go, how to get there, and when they arrived to achieve content learning objectives. Despite their instructional styles of content, these teachers recalled definitions and discussed non-context related topics to analyze complex ideas; they transmitted information efficiently and effectively.

These teachers emphasized the significance of meaningful, newly formed information used in discretionary problem solving by collecting data, processing it, sorting it, and categorizing it. All used uniquely individual approaches to stimulate curiosity and interest in students; they told jokes, used humor, used individualized stories, used previous and current events, and used metaphoric analogy. They not only aroused such interest, but also helped students expand their insights and depth of knowledge.

Answering students' questions with other problematic questions, teachers created semi-structured and open-ended environments to enhance student thinking and decision making skills. These teachers were leaders, facilitators, and coaches of their classrooms; they balanced the academic climate they created through intuition and inquiry to better serve the student's needs of learning and thinking. With teacher as guide, many students appeared encouraged to dig deeper; to explore the unknown. These teachers inspired students by their positive attitude and their strong passion for what they do. This attitude not only encouraged students to learn, but also helped to create a positive climate that promoted learning enjoyment. Teachers enjoyed what they did and shared this enjoyment with students. Leading

their classroom by example and continuously seeking to inspire appreciation for learning excellence, these teachers accepted countless opportunities to become role models for their students.

Some well-structured teaching methods were lecture based; other teachers preferred a looser style of instruction. They conducted various activities centered on the learner through class discussion, group discussion, games, brainstorming and synectics. They did not allow their individual teaching methods, however, to preclude them from accompanying students on a journey of thinking and exploration. Some teachers, more than others, practiced various methods and strategies to create an environment that fostered learning and creative thinking. Worthy of mention; the strength of this study does not live in one exemplary teacher's style, methods, or strategies. The synthesis of these methods, styles, and strategies should help create learning environments that promote creative thinking and problem solving.

The difference between good teachers, effective teachers, and creative teachers caused confusion for the researcher as he attempted to answer this complex question. In conclusion, the researcher proposes the following additional interpretation: Good teachers might be effective teachers; however good teachers might not be creative teachers. Good teachers might be effective teachers if they used their effectiveness to the advantage of the learner to achieve educational purposes; however, effective teachers might not be creative teachers. Creative

teachers need the positive characteristics of good teachers and effective teachers. Otherwise, their novelty and uniqueness in being creative might be unfulfilled.

Teachers and students collaborated in these observed classroom settings to explore questions, to detect problematic scenarios, and to seek possible solutions. However, these teachers differed in the way they sought such answers. Some teachers based their primary methods of teaching on discussion, controversial debates, drill-and-practice, exploration, and discovery. Other teachers based their primary instructional methods on lectures and presentations. To varying degrees, their methods addressed the four domains of learning. Some teachers focused on the cognitive learning domain; other teachers focused more attention to the affective domain involving motor skills and interpersonal skills. Only three of the eight teachers incorporated the elements of all domains. Such focus seemed to vary according to the discipline of the subjects taught and according to the teacher's interest in the subject that he or she teaches.

The most frequent kinds of multimedia used in observed classrooms were: television, VCR, overhead projector, computer-panel projector, chalkboard, printed materials, books, diagrams, and maps. Notably, according to information shared by the students during the interview process, the content of the subject matter taught and its complexity was secondary in importance to the way the teacher teaches the content. Also significant was the way in which the climate of the classroom attracted learners, aroused their curiosity and interest, or turned them away.

Most students in this study seemed preoccupied concerning the manner in which teachers treat them. Many students' responses showed great appreciation and admiration for the teachers selected for this study. They indicated great respect for these teachers who treated them with respect, honesty, and integrity. In addition, the students also showed appreciation for teachers who perceived them as adults; as human beings with individual entitlements, needs, feelings, and diverse abilities. Many students who praised the teachers in this study also told the researcher that they sensed a lack of attention and a lack of communication with some other teachers during their academic studies. As a result, the students felt rebuffed by the teachers who disavowed them. Their perceived rejection produced negative impressions, apathy, and strong dislike for some teachers.

Although some structural specifications existed in all classes, structured classroom instruction did not seem to exclude the feasibility of exploration, flexibility, and creativity to accommodate for individual needs of students. Moreover, the researcher noted during classroom observations that less structured classroom management seemed to provide greater flexibility and greater probability for students to explore than did well-structured classrooms. Students had a tendency, however, to favor some structure as opposed to no structure at all. They preferred to know what the teacher expected of them to achieve required instructional objectives.

What students seemed to fear most is failure; and, when they lacked required entry skills, they also seemed to have less self-confidence. They preferred a more clearly defined classroom structure because it reduced ambiguity of academic content. Other students, accustomed to well-structured classrooms, complained about disorganization and lack of classroom learning structure. Many students correlated structure with conformity, control, lack of flexibility, and traditional lecturing.

Expressive responses by students suggest that they need to feel a humanitarian alliance with their teachers. Achieving balance of structure and flexibility in classroom environments; achieving instructional objectives; accommodating diversified learning needs; these exemplary teachers shared all these qualities. A teacher's ability to captivate student interest and motivate curiosity during the learning process seemed important in achieving learning objectives of the content and in educating them.

Most students showed great interest in learning by creative instruction methods and by analytical instruction, as well. They favored a relaxed, comfortable climate over an authoritative, conforming climate. Students favored teachers who listened to them; who showed feeling, opposed to teachers who issued orders and demands. Exemplary teachers informed students of the purpose behind given assignments, activities, projects, and exercises and how to apply the learned techniques and strategies in solving problems and reaching solutions.

Open communication between student and teacher seemed to build trust in them. Exemplary teachers carefully, purposefully, and deliberately selected and organized the material that they presented to students. They did not follow rigidly existing guidelines, since their body of knowledge is rich and in-depth; however, they were mindful of learning objectives and how to achieve them. These teachers were good leaders who created warm, challenging, and safe classroom climates that allowed students to grow intellectually and individually.

Exemplary teachers persuade by leadership; they lead by example and honest service to the student. In cooperation with the teacher, students willingly achieve learning goals; together, they built trust and respect for each other. These teachers also expected their students to succeed and excel. They created an open climate; an encouraging supportive environment that enabled students to extend their efforts in learning to become independent thinkers and problem solvers. Most students preferred the teacher to lead the classroom by coaching, directing, and facilitating the total learning experience. All eight teachers expressed concerns that many incoming students lacked required entry skills; therefore, they attempted to reinforce and refresh in students the required entry skills necessary to study the current subject.

SUMMARY OF OBSERVATIONS

Emerged constructions from this study indicate the importance of fostering a learning environment that promotes creative thinking and problem solving. As a

result, the researcher encourages teachers to construct teaching methods by uniting and nurturing the following elements: 1) classroom climate; 2) teacher character traits; 3) classroom management; 4) teacher's passion and attitude toward students, subject, and teaching; 5) teaching style: what and how; 6) teacher's knowledge; 7) teacher-student interaction; and 8) students' attitudes.

Feelings, attitudes, behaviors, boundaries, and constraints influence a classroom temporary culture, generally a term of one semester in length, created by teacher and student. During this study, the researcher observed that those classroom climates that promoted creative thinking and problem solving were: open, comfortable, relaxed, challenging, safe, supportive, trusting, humorous, energized, and collaborative. Such climates rewarded creative behavior and encouraged thinking and exploring processes; students were free to voice opinions through non-threatening, entertaining, and enjoyable methods.

The exemplary teachers selected for this study shared many character traits. They were: approachable, personable, creative, caring, flexible, knowledgeable, energetic, interesting, motivating, imaginative, innovative, aesthetic, seekers of possibilities, leaders, insightful, original, and unique.

In addition, the researcher noted that the teacher's ability to manage conflicts and minimize disruptions, to design classroom physical set-up, and to create innovative classroom activities were important to smoothly managed classroom environments.

The researcher observed that passion for subject content influenced the manner in which an individual taught the classroom; which, in turn, reflected a strong commitment to student learning and success. Notably, the researcher observed that teachers who enjoyed positive attitudes toward students and subject content stimulated inquisitiveness in their students and a resulting interest in the subject matter.

How someone teaches is vital to learning. A teacher's use of diverse methods and strategies in presentation of subject content, in leading discussions and debates, and in encouraging small group interactions, nurtures a student's curiosity. These approaches encourage students to study issues from contrasting views. The selective content of what to teach is yet another important element. Focus upon the quality of instruction, not upon the quantity of information presented, assists teachers in sustaining student curiosity and encourages abstruse exploration. In reaching the conclusion of presentation material, teachers should be mindful not to rush the learning process. To do so might compromise teacher and student interaction and might jeopardize the student's comprehension of the subject content.

The researcher observed that the exemplary teachers selected for this study exhibited an in-depth and rich specificity of knowledge in the subject matter and the field of study. These teachers also held considerable knowledge about other issues, topics, and domains.

The researcher also observed that teacher-student interaction in the classroom sought numerous possibilities in fostering creative climate. In addition, these teachers displayed much respect toward the students who asked unusual questions and who held opposing opinions. Most teachers in this study used numerous methods to continuously show support of students' ideas, thoughts, comments, and feelings. They provided positive, constructive responses in correcting student mistakes or in answering student questions. Although students truly appreciated creative classroom climates, they expressed a deeper need to gain the teacher's attention regarding their feelings and concerns.

RECOMMENDATIONS

During this research study, the investigator received many comments from teachers and students concerning the way that teachers might select and organize content presentation. Many suggested new information might accompany prior knowledge, prior information, and required entry skills. It is the learning outcome objectives that guide and evaluate classroom instructions; and not the classroom instructions that guide and evaluate learning outcome objectives (Gagnè, et al., 1992). The collection and synthesis of data suggest that the basic nature of learned information is far more important than the numbing process of memorization and regurgitation of information. As affirmed by the teachers interviewed in this study, teachers need to find ways to encourage students to produce their thinking. Teaching is a means to a goal, but it is not the final goal. Exercising care in the

thoughtful planning of content delivery manifests greater comprehension by students of the subject matter. Thorough presentation of abundant information exacts a clearer focus on the primary meaning of content to help students understand ideas.

Focus on the memorization of trivia does not necessarily allow students to grasp a broader understanding of subject content. Today's competitive world needs independent, creative thinkers; the rise of the information age sets our world on a pilgrimage of new discovery. Most new technologies and inventions emerge from the synthesis of existing knowledge by individuals who cast aside unforgiving rules. These individuals violate such rules, not from insurrectionist behavior or for the simple pleasure of violating preexisting regimens, but do so for purposes of creating new rules and exploring new paths.

An innovative teacher can create ways to build mutual successes between themselves and their students. A preliminary step to academic success is the teacher's attitude toward students and envisioned student success. Therefore, the researcher suggests that teachers attempt to tolerate new ideas and differences of opinion. Expect students to make several attempts toward success until they achieve it. Continuously work with them toward their successes (Appendix A). Be courageous. Be willing to risk the venture of fresh avenues of teaching and learning. Build teamwork in the classroom. Consider what triggers, inspires, and motivates a student's intellectual and individual interests. Relate real world

experiences to students; educate them not only students, but also as individuals and citizens. Be positive; reflect a positive attitude. Treat students with respect, admiration, and integrity. Challenge the imagination; encourage innovation.

Create a student-centered environment; learn together. Involve students in all processes of learning; guide them through difficult challenges of problem solving. Inspire effectual group discussions review and expand students' knowledge of learned materials, issues, and topics. Try to present open-ended, obscure questions for which there are no clearly right or wrong answers. Ask students to find discretionary explanations and solutions to solve problems. Substitute traditional testing with case studies, projects, and assignments that evaluate students' understanding. Challenge their learning through experimentation, novelty, and originality--not through their abilities to memorize. Help students to progress gradually from being memorization-dependent to become independent thinkers and problem solvers.

Be open minded to change; encourage new ideas, opposing ideas, and challenging ideas. Be the leader of the classroom extended family. Lead with insight; extol a passion for learning. Teachers are academic leaders whom students look to for guidance and direction. During teacher and student interviews, several individuals emphasized that sometimes students never met a positive role model, although they searched endlessly for one.

Many lives depend on a teacher's talent to navigate their thinking skills into an unexplored realm of knowledge and power. They reap what they find to face a raging, competitive world. Changing an individual's life for the better through education is a miracle in itself. Education is not only about learning a skill, learning to read and write, and earning a degree. Education is also about human relationships and human interaction. Education should help to build a competent society where honorable, capable, professional citizens strive to understand each other and strive to structure a better future for all humankind.

It takes an entire village to raise a child.

-- African proverb

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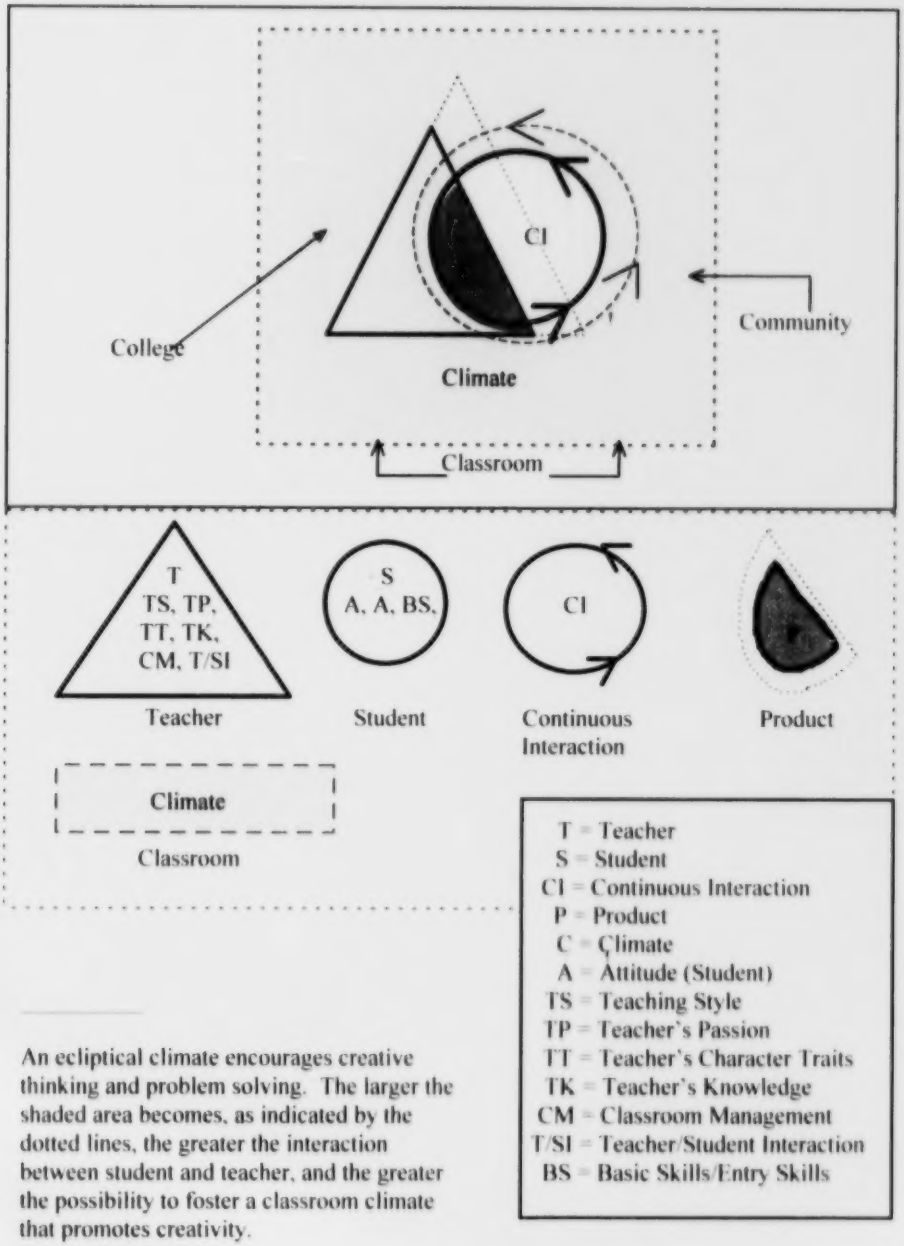
APPENDIX A

ECLIPTICAL INTERACTION



An ecliptical climate encourages creative thinking and problem solving. The larger the shaded area becomes, as indicated by the dotted lines, the greater the interaction between student and teacher, and the greater the possibility to foster a classroom climate that promotes creativity.

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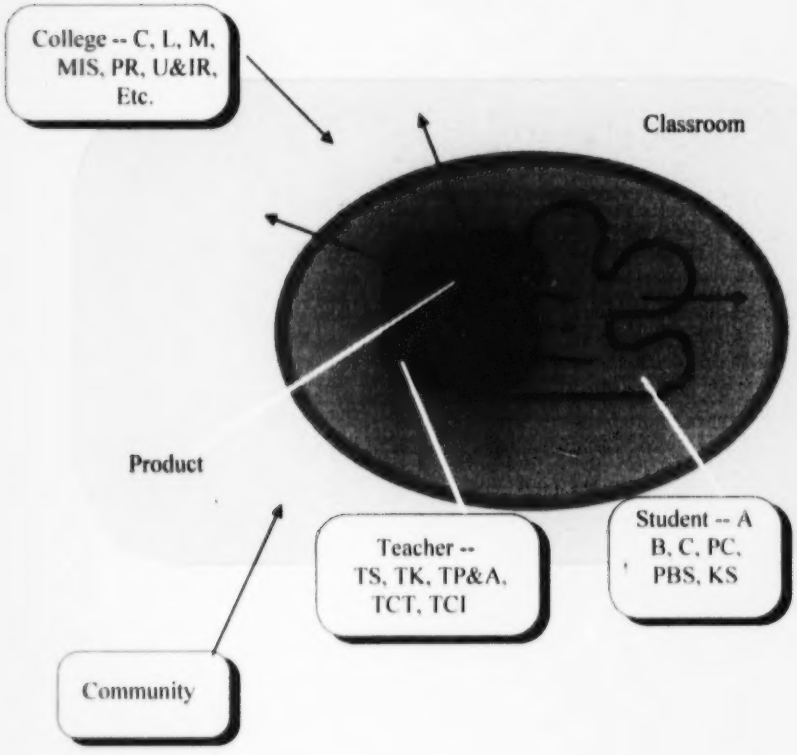
APPENDIX B

A TEACHING MODEL & INVOLVED VARIABLES

IN THE COMMUNITY COLLEGE CLASSROOM



This graph represents the mass interactions, influences, interrelating, and complex structures of the various observed classroom settings at LSC as emerged from this study. Interactions and influences of each component of the model, or its counterparts, are indicated by the directional arrows to and from each component. Black arrows reflect variables influence and interactions on each component. White lines identify teacher, student, and product. The community and school influence the classroom and teacher.

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